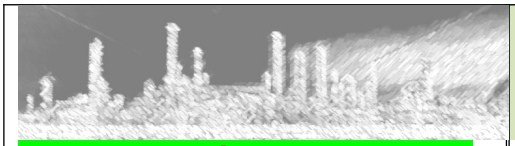
# Applications for welded plate heat exchangers

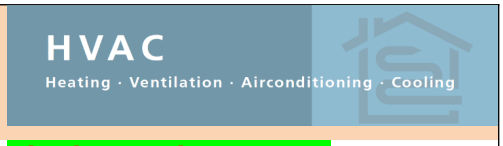
GESMEX heat exchangers are extremely versatile and can be found in practically every industry. They heat up, evaporate, condense and cool various media in a multitude of different types of process plants.



**Power Generation & Energy Storage**
Heat exchangers in power plants, waste incineration plants or in plants for energy storage ...

**Biofuels & Renewable Resources**

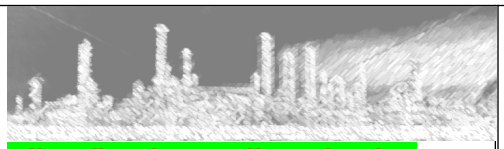
Heat exchangers in production plants for biodiesel, bioethanol, biogas, starch, sugar, pulp & paper ...



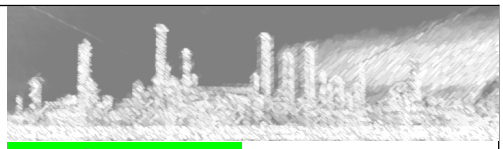

**District Heating & HVAC**

Heat exchangers for district heating supply to grid, heat transfer stations, geothermal energy, residual heat utilization ...

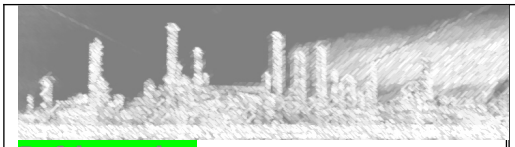
**Chemical Industry & Life Science**
Heat exchangers and reactors in the petrochemical and specialty chemicals industry, in biotechnology plants ...



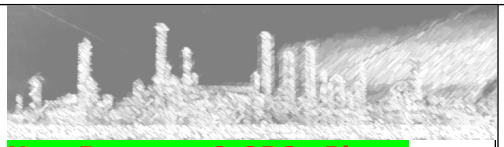
**Oil Refineries & Oil production**
Heat exchangers in upstream offshore production, crude oil distillation and downstream processing ...



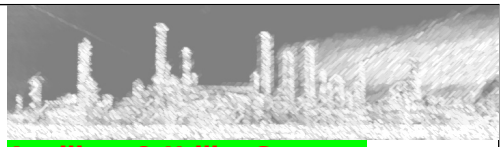
**Gas Plants & LNG**
Gas drying; Desulphurisation of natural gas; LNG - natural gas liquification; heating and cooling of industrial gases ...



**Refrigeration**
Condensers and evaporators in CO2 and ammonia refrigeration systems, with droplet separators ...



**Heat Recovery & ORC - Plants**
Power generation in ORC plants; heat recovery from waste water, exhaust gases, waste steam, process waste heat ...



**Auxiliary & Utility Systems**
Heating of process water, cooling of lubricants, air drying, jacket cooling, surface treatment ...

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Einkaufsbedingungen

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*... mehr*

- **Plate heat exchangers in power plants and energy storage systems**
  - **Condensers at steam turbines**
  - **Condensate sub-cooling & heat extraction**
  - **Feedwater pre-heating**
  - **Cooling of cool-down-basins**
  - **Gas and electrolyte cooler in electrolysis plants**



# Plate heat exchangers in power plants and energy storage systems

Weather using fossil fuels, waste or biomass fired heating plants or power plants, the thermal tasks are similar regardless of the fuel used. Heat exchangers are used as condensers, condensate sub-cooling, feed water pre-heating and heat extraction. Some distinctions lie in the operating temperatures or the flow rates.
In nuclear power plants heat exchangers are also used for cooling of wet storage.
Heat exchangers operate as gas and electrolyte coolers for storing renewable energy with electrolysis plants.

The following examples show the experience of GESMEX in these areas:

## Steam turbine condenser

AU00044-XPS150-0485-Agence-E210

The main task of condensers, after steam turbines, is the complete condensation of the vapor from the turbine exhaust. This prevents back pressure, ensuring the maximum performance of the turbine. The condensate is then recycled back into the process.
XPS - Plate & Shell heat exchangers are high performance condensers, with a close temperature approach and compact footprint minimising the water use and structual steelwork. The cylindrical shell design allows large connection at steam inlet and smaller connection at steam outlet.

*← Example: post-condenser to a steam turbine*
*Type: Plate & Shell, XPS 150, counter-flow, fully welded,*
*Installation site: France*

## Condensate sub-cooling & heat extraction

AU00308-XPS100-0957-ZAOINSYSTEMS-P110

Sub-cooling the condensate, ensures complete condensation is achieved, even in periods of low heat demand. Cooling can be done via an open re-cooling circuit or via heat recovery, boosting a district heating network or used in industrial applications as process heat.

XPS - Plate & Shell heat exchangers are well suited for sub-cooling duties due to the very compact design and high heat transfer rates. Multi-pass configurations enable long thermal lengths, achieiving very close temperature approaches.

*← Example: condensate cooler in a steam power plant*
*Type: Plate & Shell, XPS 100, crossflow, both sides openable, multi-pass by an external bypass circuit*
*Installation site: Russia*

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| multi-pass | liq/liq | | Heizer | PG 50% | Heater | 25.757 kW | | Water | PG 50% | 185 |
| 100 | 21 | 39 | | | | | | | | |

## Feedwater pre-heating

900001-XPS50-24-GESTRA-E210

Boiler feed water can be pre-heated in two stages:

- The feed water is first heated to just below the bubble point before the feed-water dearator..
- It is then heated further before entering the boiler to minimize the sensible heat required in the boiler.

XPS - Plate & Shell heat exchangers are preferably used with steam: low-pressure steam before feedwater dearation, medium or high pressure steam before it enters the boiler.

← *Example: feedwater heater before dearation*
*Type: Plate & Shell, XPS 50, counter flow, fully welded*
*Installation site: Germany*

## Cooling of cool-down-basins

1411 für KKW Gösgen_Testplatte an TU Dresden

In the the nuclear industry, heat exchangers cool down water bath where spent fuel elements are stored. The storage usually lasts for several years, until the the fuel elements can be transported.
XPT - Thermo Plate heat exchangers are used as water-cooled immersion coolers. The cooling elements are designed to fit the tanks, and fixed where suitable. In addition to the usual pressure vessel codes, extensive manufacturing and testing to satisfy the safety regulations of nuclear power plant are met.

← *Example: immersion coolers for wet storage*
*Type: XPT - Thermal Plate, material, pressure and temperature resistance according to individual project specification*
*Installation site: Germany*

## Gas and electrolyte cooler in electrolysis plants

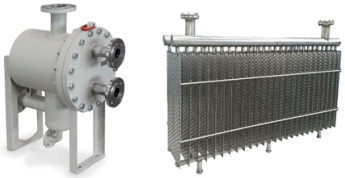
AU00005-XPS50-0410 ENERTRAG-P140

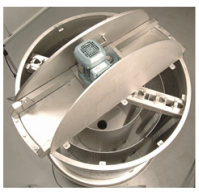
Gas coolers in hydrogen electrolysis plants cool hydrogen and oxygen obtained by the electrolytic decomposition of water. In particular the hydrogen is used for energy storaging to stabilize the power generation from renewable energy. The electrolyte must be cooled during operation.
XPS - Plate & Shell heat exchangers are used for hydrogen coolers, oxygen coolers, electrolyte coolers and pre-heaters.

← *Example: hydrogen cooler in an electrolysis plant of a hybrid power plant*
*Type: Plate & Shell XPS 50, crossflow, openable, multi-pass, with service opening*
*Installation site: Germany*

3 Stück Gaskühler Wasserstoff, 3 Stück Gaskühler Sauerstoff, 3 Stück Elektrolytkühler und 3 Stück Wärmetauscher (Heizer)

## Heat exchangers in utility systems and for heat recovery





In addition to process-specific tasks, GESMEX plate heat exchangers are also used in numerous auxiliary and utility systems, such as: heating of cleaning solutions, cooling lubricating oil, drying compressed air, jacket cooling ...

*... more about auxiliary and utility systems*

GESMEX plate heat exchangers are used for heat recovery from exhaust vapors or flash steam, in sewage systems, for heat recovery or power generation from waste gases ...

*... more about heat recovery*

## Facts about welded plate heat exchangers

request Information

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XPS - Plate & Shell heat exchangers are well suited for use with liquids, gases, and both evaporation or condensating duties. The gasket-free and cylindrical design allows operating pressures from full vacuum to 400 bar and temperatures ranging from -200 to 500 ° C.

XPT - Thermo Plate heat exchangers are well suited for use with dirty media, and for minimal pressure losses at high volume flows. The fully welded plates are used from vacuum to 60 bar and from -200 to 800 ° C.

Both systems come in a variety of sizes and have a flexible design to cope with different medias and connections to suit the individual case.

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- **Plate heat exchangers in plants for biofuels and renewable resources**
  - **Biodiesel plants**
  - **Bioethanol plants**
  - **Biogas plants**
  - **Biomass drying**
  - **Starch production and processing**
  - **Sugar production**
  - **Paper & pulp production**



# Plate heat exchangers in plants for biofuels and renewable resources

Biofuels are produced from biomass, the most common types being biodiesel, bioethanol and biogas. Plate heat exchangers are used to heat and cool liquids and gases, or as condensers and reboilers in distillation columns.
Biomass must often be heated for further use and dried. In the recovery of renewable feedstock such as starch, cellulose and sugar, heat exchangers for heating, evaporation and heat recovery are used. The different consistency, and solid content, of the feedstocks, means different types of heat exchangers are required.

The following examples show the experience of GESMEX in these areas:

## Biodiesel plants

200112-XPS50-0215- BDI -P250

Biodiesel is made from vegetable oils, such as soybean, sunflower or palm oil or from animal fats, by a chemical reaction with methanol. Heat exchangers are used in various process stages for pre-heating, glycerine heater and cooler, and in the methanol distillation, as economizers.

All welded construction of the XPS - Plate & Shell heat exchangers is recommended for high temperatures or pressures, or if chemical attack of ingredients excludes the use of plate and frame heat exchangers with gaskets. XPS units are currently operating as methanol - condenseors or feed / effluent heat exchanger.

← Example: High pressure - oil heater fully welded,
Type: Plate & Shell, XPS 50, max. 120 bar, 300 ° C, multi-pass on both sides
Installation site: Scotland

## Bioethanol plants

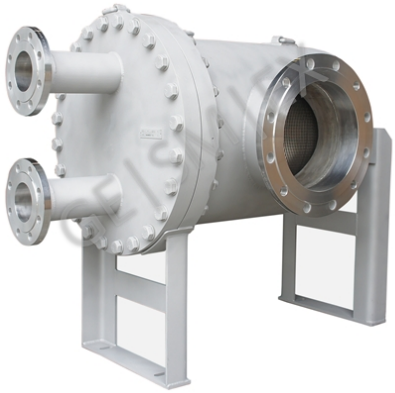
Bioethanol is produced by the fermentation of sugars, such as sugar beat or cane, hydrolysed starch from cereals, or cellulose.
Heat exchangers are used in bioethanol plants as mash heaters, reboilers, overhead condensers or as economizers in distillation columns and heat recovery.
XPS - Plate & Shell heat exchangers are operating as condensers, for condensing ethanol vapor after distiallation or ethanol cooling..
XPT - Thermo Plate heat exchanger can be used as heating plates in flooded reboilers to concentrate mash.

← Example: ethanol condenser, openable
Type: Plate & Shell, XPS 100, to 200 ° C, -1 to 10 bar
Installation site: China

200163-XPS100-0321-P430-API Suzhou

SPWÜ liquifies the 95% ethanol vapor produced by the distillation column.

## Biogas plants



Biogas can be produced from the fermentation of biological waste, such as biproducts from bioethanol, or from other biomass.
Heat exchangers are used for sludge heating and cooling andcondensering to dry steam-saturated biogas.
XPS - Plate & Shell heat exchangers are particularly suitable for use in clean media and as condensers.
XPT - Thermo Plate heat exchangers are used for heating and cooling sludge or other contaminated media.

← Example: Dump cooler, cross-flow to minimize the pressure loss at the shell side high flow
Type: Plate & Shell, XPS 100, openable
Installation site: Sweden

| | | | | | | |
|---|---|---|---|---|---|---|
| 200161-XPS100-0317-API-P250 | GOBIGAS 20MW Cooling Water | liq/liq 25 | Kühler 35 | Dump Cooler 131 | 7.094 kW 75 | Hot Water |

## Biomass drying

Biomass drying systems are as diverse as the material to be dried, and the consistancy can vary greatly: liquid as digestate, a slurry, or particulates, such as grain or wood chips.
Heat exchangers are used for heating the biomass, combining preheating and heat recovery from exhaust air.
XPT - Thermo Plate heat exchangers are especially suitable for these applications. The heat transfer surfaces can be produced in different types and sizes. They can be used both as a heating jacket or internal heating surfaces. The heating media can be distributed by welded flow channels for uniform and gentle drying on the plates.

← Example: jacket heating to a stirred vessel, heating medium steam
Zype: Thermal Plate, XPT, complete heating of the whole mantle circumference
Installation site: Denmark

ACO

## Starch production and processing

Starch is mainly produced from maize, wheat, potatoes and cassava. After crushing and washing the raw material, heat exchangers are used for heating and cooling starch solutions for saccharifion of the starch, evaporatoring for concentrating the hydrolyzed starch, or for cooling of concentrates.
XPT - Thermo Plate heat exchangers are used, if the product contains solids, as with shredded raw materials, or if the product is highly viscous, such as concentrates.
XPS - Plate & Shell heat exchangers are utlised for cleaner media, such as preheating of process water, cooling of products or heat transfer fluids and for condensing exhaust steam.

← Example: thermal oil cooling in a plant for the production of sorbitol (sugar alcohol)

Type: Plate & Shell, XPS 50, multi-pass on both sides for a long thermal length and close temperature approach
Installation site: Germany

200134-XPS50-0262-DHW

200134 DHW Deutsche Hydrierwerke Rodleben GmbH XPS 50-312 H33 0,60 1.4404 P265GH 0-verschweißt 0262 Steigerung Kühlleistung R1030 liq/liq Flüssigkeitskühler Kühler Wärmeträger 650 kW Therminol MCS 2424 Kühlwasser 67 33 25 49

## Sugar production

Sugar is produced from sugar beet or cane. The crushed raw material is mixed with hot water to extract the sugar. The raw juice is then concdentrated by evaporation, increasing the sugar content before crystalisation. Heat exchangers are also used for pasteurization, cooling syrup or heat recovery.
XPT - Thermo Plate heat exchangers are used in direct contact with sugar solutions. Their design allows a good cleanability as well good surface temperature control to avoid burning the product.
XPS - Plate & Shell heat exchangers are often used as a steam-heated preheaters of process water.

← Example: steam heater for heating process water in a sugar factory
Type: Plate & Shell, XPS 100, openable shell for quick replacement of the plate package to minimize downtime,
Installation site: Germany

AU00089-XPS100-0633-API-P260

P260_Zuckerherstellung Südzucker, Ersatzapparat für 0467?? cond/liq Dampfheizer 1.030 kW Sattdampf VE-Wasser 139 139 20 95

## Paper & pulp production

Pulp is obtained from plant fibers, wood is shredded and in a cooking process in reactors, chemically macerated, forming pulp. For papermaking, the pulp is mixed with preheated water. During the production process recycled white water is preheated again for further use.
XPT - Thermo Plate heat exchangers have free flow channels and can be used for heating the fibrous white water without clogging.
XPS - Plate & Shell heat exchangers are used to heat up water for the milling process or in paper production.

← Example: Process water heater in a pulp mill, heating medium: steam
Type: Plate & Shell, XPS 100, internal eccentric distributor to avoid maldistribution
Installation site: Finland

200153-XPS100-0307-Örnalp-P270

XPS 100-474 G11 1,00 1.4404 P265GH 0-verschweißt 0307 P270_Papier & Zellstoff Replacement of S&T, delivered 1975 liq/cond Kondensator Condenser 8.605 kW Condensate Steam / Condensate 30 55 156

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and utility systems*

.. ...

*... more about heat recovery*

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

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- **Plate heat exchanger in the district heating and HVAC**
  - **District heating feeding-in**
  - **Geothermal energy**
  - **District heating transfer**
  - **Utilisation of residual heat in condensate systems**



# Plate heat exchanger in the district heating and HVAC

GESMEX plate heat exchangers are working in district heating systems as heaters or heating by condensing steam to transfer the district heating to the house connection stations. The design of geothermal plants has a large impact on the level of conversion from geothermal energy into a technically usable form. The increased efficiency of GESMEX heat exchangers using residual heat into condensate systems, greatly improved the heat recovered and hence the overall amount of heat provided into the system.

The following examples show the experience of GESMEX in these areas:

200140-XPS-100-0292-V Heat-E210 *

## District heating grid supply

District heating supply is the acquisition of heat generated in heating plants, or thermal power stations, in the district heating network. Alternative heat sources are from: waste incinerators, geothermal or waste heat coming from industrial facilities. If the supplied energy is not fed as a vapor directly into the district heating system, it is done via an indirect heat exchanger, which are designed for the performance of the whole district heating network. This allows the steam to be returned to the boiler or process plant without contamination.
XPS - Plate & Shell heat exchangers are used as steam heaters or recover heat from hot water.

← Example: Unit for district heating supply, media: water / water
Type: Plate & Shell, XPS 100, small footprint with big performance,
Installation site: France

200107-XPS100-34-BASF-P400 (Heißwasser Wasserdampf)

## Geothermal energy

Geothermal energy is the use of natural geothermal energy from near-surface layers or deep boreholes. When geothermal energy does not get utilised directly, such as direct power generation in steam turbines, heat exchangers are used as an intermediate heater to produce hot water for use in district heating facilities or fulfill process plant heating requirements. Is the temperature level of geothermal sources not high enough, it can be raised by heat pumps.
XPS - Plate & Shell heat exchangers are used to extract geothermal energy in two ways: when the heat source is either steam or hot water. Especially with temperatures below 100 °C, there is the possibility of ustilize the close temperature approach to recover more energy. Suitable heat exchanger plates can be selected to resist any corrosion caused by aggressive components in the geothermal media.-

← Example: interchanger, media: water / water
Type: Plate & Shell, XPS 100, short length and large plate diameter for a close temperature approach,
Installation site: Germany

lt web. Wasser/Wasser 1 bis 10 bar 80 bis 150°C:

Ordner: 1001 Gestra Modul

## District heating transfer

District heating distribution is the extraction of heat from the district heating system forthe end user. Heat exhcnagers are used to remove heat from the hot water loop and delivered to the individual customer, such as to heat a building. XPS - Plate & Shell heat exchangers are used for high capcity district heating transferto customers. To simplify installation work, prefabricated modules are assembled with switchgear and control devices by GESMEX partners. When steam is utilzed, a condensate collector and lifting lugsare intregrated in the module.

← Example: Heat transfer station, ready assembled and wired
integrated: Plate & Shell, XPS 50, steam heated, steam side
Installation site: Germany

200005-XPS100-0011-GESTRA-E220 aux. steam generator water steam demin. Water / steam

## Utilisation of residual heat in condensate systems

Steam-heated systems tend to be used in larger buildings with technical equipment, such as hospitals. Heat exchangers are used when residual heat from high, or medium pressure condensate is used to transfer this to lower temperature consumers.
XPS - Plate & Shell heat exchangers are highly effective steam condensers. If the heat is transferred to a water circuit, a simple welded design is used,.
The Kettle Type is very well suited when low-pressure steam is generated. The larger shell interior gives the steam sufficient space to develop, and the larger volume enables disentranment of the vapour in addition to acting as a buffer for variations in engery demand.

← Example: low-pressure steam generator
Condensation of flash steam and sub-cooling of high-pressure condensate
Type: Plate & Shell, XPS 100, Kettle Type, openable
Installation site: Germany

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and ...*

... ...

*... more about heat recovery*

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

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- **Plate heat exchangers in the Chemical Industry and Life Science**
  - **Steam heaters in process plants**
  - **Circulation evaporators**
  - **Flash condensers**
  - **Gas coolers / partial condensers**
  - **Liquid coolers**
  - **Evaporators**
  - **Preheater / Economiser**
  - **Gas heater**
  - **Reactors**
  - **Heat recovery in process plants**



# Plate heat exchangers in the Chemical Industry and Life Science

From basic chemicals, in typically large production volumes, through specialty chemicals to end products in reducing quantities, thermal processes play an important role in most manufacturing operations. Pure components, or mixtures, are heated or cooled, partially or fully evaporated or condensed. As large as the number of chemical products is, the relevant thermal processes may differ greatly in detail. If plate heat exchangers are integrated into reactors, then heat of reaction can be added or removed directly. In Biotech, or specialty chemical production plants, smaller volumes have to be heated up or cooled down, often in batches, with jacket cooling or heating of the process vessels with recirculation.

The following examples show the experience of GESMEX in these areas:

## Steam heaters in process plants


Steam heaters in process plants heat products or water with steam. The heated products can be liquid or gaseous, one or two-phases. They can be heated or also partially or completely evaporated.
XPS - Plate & Shell heat exchangers have relatively short but wide transfer surfaces, and are therefore particularly suitable as steam condensers. For an optimal distribution of the heating medium, the plate pack can be positioned eccentrically in the shell. For large numbers of plates, maldistribution can be avoided by several inlet and outlet connections on the shell.

← Example: steam heater in the primary production of fertilizers
Type: Plate & Shell, XPS 200, 1000 m2 transfer area, both sides openable, shell side two inlet and outlet connections
Installation site: Belgium

AU00246-XPS200-0873-BASF-P500 AU00246 BASF Antwerpen N.V. XPS 200 1376 LX11 0,80 1.4571 SS 1-openable 0873 P500_anorganische Grundchhemikalien, sonstige W216 Potassium Bicarbonate Steam
Potassium Bicarbonate = Kaliumcarbonat (fachsprachlich); gemeinsprachlich Pottasche ← nicht in „Düngemittel" weil aus Pottasche nicht nur Agrarchemikalien sondern auch andere Chemikaqlien hergestellt werden.

## Circulation evaporators (Reboilers)


Circulation evaporators, also called reboilers, are used on distillation and stripping columns. For example in stripping processes, such as amine regeneration in Acid Gas Removal Units, and for the physical separation and purification of liquid products, crude oil fractionation. The liquid medium is fed counter-current to a vapor stream. At the bottom of the column a part of the liquid is vaporized again to increase the efficiency of the process, and thermally drive the separation.
XPS - Plate & Shell heat exchangers are used as circulation evaporators, predominantly in thermosiphon operation, i.e. they are installed next to the column and operated by natural circulation. Because of their high efficiency they require less heat transfer area compared to shell & tube heat exchangers. Thus the units are also lighter and smaller. Their response time is shorter due to the much lower liquid inventory, which lead to much shorter start-up times and faster control. This also give a much lower residence time, so thermal degration is greatly reduced. In addition to

this, the required volumes of chemcials such as amines can be reduced saving operating costs.

← Example: reboiler in the petrochemical industry for the separation (stripping) of alcohol from water
Type: Plate & Shell, XPS 100, openable for inspection and cleaning of the product side
Installation site: Holland

AU00205-XPS100-0811- BUSS geborgt AU00205 BUSS ChemTech AG XPS 100-112 H11 1,25 1.4404 1.4571 1-openable 0811 Ethoxilation Unit – Maschem

## Flash condensers

Flash condensers in process plants condense the waste steam or remaining steam resulting from the thermal treatment of products, such as when a product is flash cooled, or pressure is dropped, these are called exhaust vapors. Condensation is reuired to recover valuable product and energy, and also to comply with emission limits. In most cases the condensation is at atmospheric pressures or under vacuum
XPS - Plate & Shell heat exchangers are highly efficient condensers. Different physical properties of the media to be condensed lead to a variety of possible heat exchanger configurations. Larger nozzles are required to accommodate the high volumentric flow rates for vapour under vacuum. Inert gases can be removed with an integrated separator, as part of an oversizeed nozzle.

← Example: vacuum condensers in the propylene glycol production (basic chemicals)
Type: Plate & Shell, XPS 200, cross-flow, eccentrical shell, multi-pass at plate side, with a collector for phase separation and liquid collection
Installation site: Germany

200037-XPS200-0078-BASF BASF SE XPS 200 320 GCX51 1,00 1.4404 1.4571 0-verschweißt 0078 P400_organische Grundchemikalien Wärmerückgewinnung E309 liq/%cond Teilkondensator 1.725 kW Kreislaufwasser MPG + DPG (Monopropylenglykol + Dipropylenglykol) 106 127 133 130

## Gas coolers / partial condensers

In processes with partial condensation only part of the vapour is condensed, changing the composition of the product, or drying the product.
The condensation amount depends on the composition of the medium, and is controlled by the mass flow, pressure, temperature and the thermal duty.
XPS - Plate & Shell heat exchangers are effective condensers and partial condensers. The heat exchagers can be sized so that individual media are fully or only partially condensed. The cylindrical shell construction allows internal separation of thermally separated streams.

*← Example: hydrogen coolers and steam condenser in the chlor-alkali electrolysis*
*Type: Plate & Shell, XPS 50, multi-pass on at shell side with separate nozzle for condensate return, cross-flow to the pressure loss minimization at vacuum operation*
*Installation site: Germany*

200032-XPS50-0065-INEOS 200032 INEOS Chlor Atlantik GmbH XPS 50 46 HC 1 3 0,60_1.4404 P235GH 2-openable beidseitig 0065 Chlor-alkali electrolysis liq/%cond Kühler und Teilkondensator Wasserstoffkühler und Teilkondensator water nitrogen + water steam

## Liquid coolers

Liquid coolders in process plants cool products between or after processing stages. Water or heat transfer fluid are generally used as a utility.
XPS - Plate & Shell heat exchangers have high heat transfer rates which enable small designs. In addition to the small footprint, the units require much less material compared to other technologies such as shell & tube heat exchangers. This advantage is increasedparticularly when highly corrosion-resistant materials are required.

*← Example: product cooler, cooling medium: river water*
*Tyoe: Plate & Shell, XPS 100, plate material 1.4539 (904L) for increased corrosion resistance to chloride-containing media*
*Installation site: Germany*

200096-XPS100-0179-BASF 200096 BASF SE XPS 100-186 H31 1,00 1.4539 1.4539 0-verschweißt

P400_organische Grundchemikalien liq/liq Kühler Produktkühler 1.587 kW
Produkt Flusswasser 140 70 25 33

## Evaporators

Evaporation in process plants is required, when a solvent needs to be removed from a solute, typically concentrating a product or recovering a solvent. A vaporizer is when the latent heat is required in a subsequent process, such as making clean steam for pharmacuetical applicaitons.
XPS - Plate & Shell heat exchanger can be flexibly adapted to the requirements of different operating conditions. For example the volume for steam evaporation can be enlarged by increasing the shell diameter, or by an eccentric arrangement of the plate pack in the shell. A multi-pass flow guidance is also possible for evaporation duties, when the heat exchanger is installed in an upright position so that the steam exit can be vertical.

*← Example: Evaporator in a production plant for solvents*
*Plate & Shell, XPS 200, multi-pass, vertical orientation for partial evaporation at plate side and partial condensation at shell side*
*Installation site: Finland*

200158-XPS200-0314-ViFlow

Kemira Oulu FIN 200158 ViFlow Finland Oy XPS200-388 H22
1,00 1.4404 P355NL 0-verschweißt 0314 %evap/liq Waschlösung Kühler
MeOH + C2H7N 28-66 85-32

## Preheater / Economiser

An effective way of preheating products is recovering heat from a process fluid that needs cooling. A good example of this is combining a cold reactor feed that needs to be heated, and the hot reactor product that needs to be cooled in one heat exchanger, to elminate utilities. Heat exchangers with such process tasks are also called economizers or feed / effluent - heat exchangers.
XPS - Plate & Shell heat exchangers are capable of close temperature approaches, and thus a high heat recovery becomes possible.
This is achieved through a long thermal length with a multi-pass arrangement. If the volume flows on both sides are approximately the same, then the heat exchangers are configured with an equal number of passes on both sides. Crossing temperature programs are possible, i.e. to heat up the cold medium to a temperature above the outlet temperature on the hot side.

*← Example: economizer in a production plant for synthetic elastomers*
*Type: Plate & Shell, XPS 100, multi-pass on both sides, with shell jacket heating to heat up and liquify the medium in the start-up operation*
*Installation site: Germany*

200114-XPS100-0219-Evonik

200114 Evonik Services GmbH XPS 100 156 H33 1,00 1.4404
P265GH 0-verschweißt 0219 Polyvest HT, Marl liq/liq Economizer
CDT - Vorwärmer 506 kW CDT CDAN 20 153

## Gas heater

Gas heaters are usually operated with steam or liquid heating media such as thermal oil. Liquid heating media lead to highly asymmetric flow rates, i.e. the gas-side flow is multiple higher than the heating medium flow.
XPS - Plate & Shell heat exchangers can be configured with large nozzles on the shell side, coping with large volumetric gas flows. After determinating the required heat transfer area, the allowable pressure drop is the next determining factor. To optimize between heat exchanger size and pressure loss, plates with different corrugations and pressing depths are available.

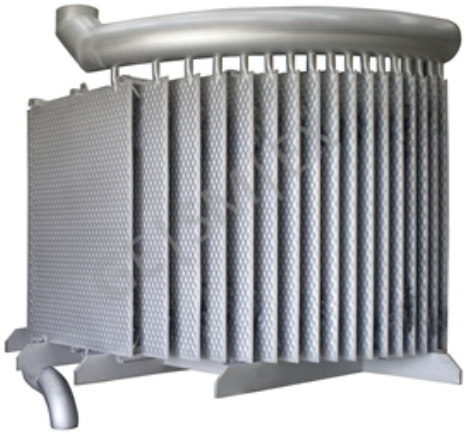
*← Example: heater of recycled gas in a plant for mineral oil desulphurization*
*Type: Plate & Shell, XPS 50, heating steam plate side, plate material: titanium*
*Installation site: Holland*

AU00093-XPS50-0635-Chemtura

AU00093 Chemtura Netherlands B.V. XPS50-212L11 0,60 3.7025
1.4571 0-verschweißt 0635 W 4203 steam recyclegas

## Reactors

In process plants heat exchangers and reactors are usually separate unit operations. Depending on whether it is an endothermic or exothermic reaction, either pre-heating is or product cooling is required. In certain processes, a combination of heat exchanger and reactor in one unit is advantageous. This is realized by the arrangement of the heating or cooling surfaces in the reactor, whereby the heat transfer with the



ACO

reaction can take place more directly.

With XPT - Thermoplate heat exchangers construction of reactors can be realized in a very flexible way. The Thermoplates can be individually manufactured in various shapes and sizes and the reactors can be built up modular. When positioning the plates and sizing the proces vessel, sufficient space is required to pack in catalysts which supports chemical reactions. Finally also the jacket of the process vessel can be equipped with heating or cooling surfaces in Pillow Plate - form.

*← Example: bubble reactor in methyl benzene oxidation*
*Type: Thermal Plate, XPT, for direct installation in a process tank,*
*Installation site: China*

It is a "bobble reactor" to remove heat from the process tank – kind of emmersion plate bank

In what kind of process is it installed? : Methyl Benzene Oxidation

– Where is it installed? Wuhan China


200132-XPS150-0258-Outotec-P165

## Heat recovery in process plants

In process plants individual steps of production often requires the cooling of products. This "waste heat"can be put into the atmosphere via a cooling tower, or recovered and used elsewhere in the plant, where lower grade heat is required. Therefore saving both cooling and heating requirments.
XPS - Plate & Shell heat exchangers transfer heat from liquid or gaseous products to other products, or into auxiliary systems. The efficient countercurrent flow of the XPS means that more energy can be better recovered than with other technologies.
If the energy level high enough, valuble low-pressure steam can be generated from the waste heat.

*← Example: steam generator from waste heat in a sulfuric acid plant*
*Type: Plate & Shell, XPS 150, plate material 1.4591 (Nicrofer 3033) to ensure the corrosion resistance to hot sulfuric acid*
*Installation site: Sweden*

P500_anorganische Grundchhemikalien, sonstige HEROS WT liq/%evap
Produktkühlung durch Verdampfung sulfuric acid cooling 2.700 kW
H2SO4 VE-Wasser 195 172 152 152

The Outotec HEROS heat recovery system is an independent sulfuric acid cooling system which utilizes waste heat from the absorption process for the production of saturated steam. It is designed as add on system and can be put in and out of operation without impact on the sulfuric acid plant.

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and supply systems*

.. ...

*... more about heat recovery*

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

- **Plate heat exchangers in refineries and oil and gas production**
  - **Circulation evaporators (reboiler) at distillation columns**
  - **Top condensers at distillation columns**
  - **Economizers at distillation columns**
  - **Coolers of refinery products**
  - **FPSO - Floating Production Storage and Offloading Unit**

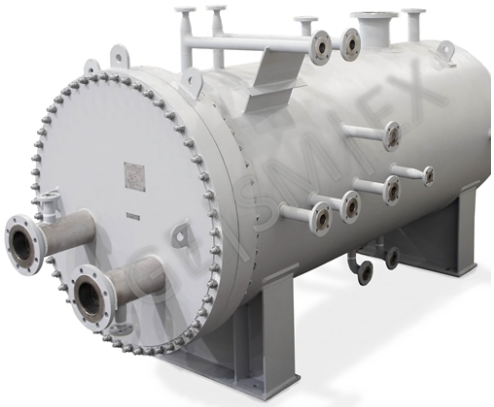


# Plate heat exchangers in refineries and oil and gas production

In refineries heat exchangers are used for the crude oil distillation and subsequent refining stages. GESMEX heat exchangers are used as preheaters, re-boilers, condensers, economizers and as cooler of refined products. In production sites onshore and offshore crude oil is preheated, tanks heated, gas dried and TEG regenerated.

The following examples show the experience of GESMEX in these areas:

## Circulation evaporators (re-boilers) at distillation columns



AU00003-XPS150-0405-H&R-P320

Circulation evaporators are used in refineries at distillation columns to heat up the bottom-liquids and to generate steam, which is fed back to the distillation tower.
XPS - Plate & Shell heat exchangers can be configures as kettle re-boilers or as thermosyphon - reboiles. Kettle re-boilers require rather no static heights. Thermosiphon – re-boilers have smaller filling volumes and shorter reaction times.
Openable versions allow the removal and mechanical cleaning of the plate packages.

*← Example: Kettle Typee circulation evaporator, openable shell*
*Type: Plate & Shell - XPS 150; Media: heating medium vs. oil*
*Installation site: Germany*

Umdeutung: Der Apparat ist eigentlich eingesetzt für Furfurol vs. Speisewasser

## Top condensers at distillation columns

AU00273-XPS200-0912-ZAO/LUKOIL-P320

Top condensers condense and cool residual vapors in distillation columns. They work as reverse flow condensers when they are are put directly at the column. Circulation condensers are placed near the top of the column and work as s a flow-through condensers.
XPS - Plate & Shell heat exchangers are effective condensers and well suited for both modes of operation. Of particular advantage, compared to tubular heat exchangers, is the compact and lightweight design which enables the installation close to the column head.

*← Example: top condenser for an atmospheric distillation column*
*Type: Plate & Shell - XPS 200; Media: Water vs. unstable gasoline*
*Installation site: Russia*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| AU00273 | ZAO Tehinzhoyl 0912 P320_Erdölraffinerie | XPS 200-450 | H11 | 0,80_14.404; CS | 0-verschweißt | | | | |
| liq/%cond | Teilkondensator | LUKOIL, Upgrading - Crude distillation unit condensing and cooling the overhead of the atmospheric tower | | | | | | | |
| 6.000 kW | water | unstable gasoline | 70 | 90 | 115 | 75 | | | |

## Economizers at distillation columns

On distillation columns but also in other stripping systems XPS - Plate & Shell heat exchangers are used to preheat the incoming fluid through the outflowing medium. Heat exchangers with such tasks are called economizers or feed / effluent interchangers. Due to the high heat transfer coefficients plate heat exchangers generally offer themselves for economizer applications. They achieve closer temperature approaches of the hot and cold side. Moreover, in refinery processes the Plate and Shell type provides variable connections options and the possibility to use it at high pressures.

← *Example: Feed / Effluent interchanger, with insulation*
*Type: Plate & Shell - XPS 150; Media: stable catalysate vs. unstable catalysate*
*Installation site: Russia*

AU00273-XPS150-0910-ZAO/LUKOIL-P320; Text AU00372- XPS150-1056-ZAO/LUKOIL-P320

AU00372 ZAO Tehinzhoyl XPS-150 188 H22 1,00 -1.4404 CS 0-verschweißt; 1056 P320_Erdölraffinerie; LUKOIL, Upgrading; liq/liq Heater; Heat unstable catalyzate 2.961 kW 190 109 45 145

## Coolers of refinery products

The products obtained in refineries by distillation and other processing stages are cooled prior to tank storage.
XPS - Plate & Shell heat exchangers are preferably used for cooling lighter products such as gas and light gasoline (NAPHTA), kerosene and diesel fuels. For minimum maintenance requirements the heat exchangers are configuresd in fully welded design.

← *Example: Naphtha cooler*
*Type: Plate & Shell, XPS 50, fully welded plate-side multi-pass,*
*Installation site: Germany*

200006-XPS50-0010-Supresta

## FPSO - Floating Production Storage and Offloading Unit

FPSO used on offshore production sites to produce, storage and load oil and gas. Aboard heat exchangers are needed to heat oil tanks. Partially first stages of processing of the crude oil or natural gas takes place on board.
XPT - Thermo Plate heat exchangers, built from individual plates or plate batteries, heat oil tanks. The heating medium water can be heated itself in a XPS - steam heater on the deck.
XPS - Plate & Shell heat exchangers operate as steam heater in tank heating circuits. In combination with the XPT - heating plates in the tanks, the system has low weight and a low center of gravity for the benefit of the ship stability. If natural gas is dried on board, then Plate & Shell heat exchangers cool down the gas below the dew point or they work in the glycol regeneration as glycol coolers or glycol - economizers.

← *Example: TEG - cooler, prepared for surface coating with aluminum flame spraying*
*Type: Plate & Shell XPS 50 Design pressure 90 bar, several passes at plate and shell side, vertical installation for venting and draining of the multi passes*
*Installation site: Oilfield in the North Sea*

AU00263-XPS100-0894-Örnalp-P315

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and supply systems*

.. ...

... more about heat recovery

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

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# Plate heat exchangers in Gas Plants & LNG

Heat exchangers are used in natural gas processing plants for gas drying, preheating natural gas, gas sweetening or the liquefaction of natural gas. Plants for the industrial production of gases such as ammonia, synthesis gases or hydrogen also include thermodynamic processes. GESMEX plate heat exchangers operate in gas plants as liquid coolers, gas coolers, condensers, evaporators, partial condensers or partial evaporators.

The following examples show the experience of GESMEX in these areas:

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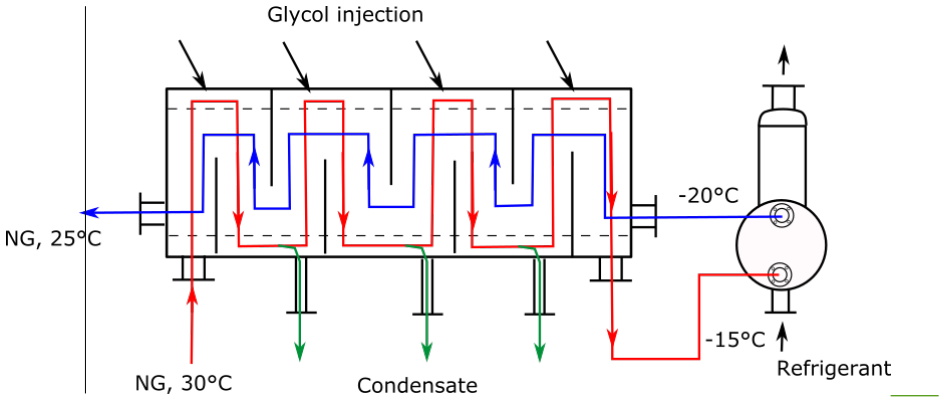
## Natural gas drying by LTS process (low-temperature separation)

The natural gas (NG) of a bore is saturated with water vapor and must be dried to meet the pipeline specification and maximum the calorific content, before being fed into a pipeline. Various methods can be used, however the LTS process controls the dew point of natural gas by condensating the water vapor. The experience the natural gas industry had with shell and tube condensers, showed that the mixture of the condensed water and heavy hydrocarbons at low temperatures (-5 to -15 ° C) forms hydrates. This leads to a blockage of the condensate outlet of the heat exchanger. To prevent this glycol or methanol is commonly injected into the heat exchanger gas inlet.

GESMEX has developed a special heat exchanger (XPS LTS) for the LTS process, which is equipped with both a glycol injection and separate liquid outlets.




The cooling medium is the natural gas itself, through a recupertive process. The natural gas leaving the XPS LTS is cooled down in a chiller by 5 - , 10 °C and then passed back through the XPS LTS heat exchanger.

This is then reheated by the incomming natural gas and leaves the XPS LTS only a few degrees colder than it entered. This internal heat recovery leads to a dehumidification of the natural gas without the noticeably lowering the temperature, and forming hydrates. At the same time, the condensate can then be safely drained.

The chiller in the LTS process is also a GESMEX heat exchanger, an evaporator which is part of the refrigeration system. For droplet separation it was equipped with a integrated knockout pot.

*XPS LTS*
*Type: XPS 100*
*Design: countercurrent flow, fully welded*
*Special features: recuperator, glycol injection, multiple drains*
*Installation site: Germany*

AU00281-XPS100-0920-GDF-P340 CFA Projekt Reitbrock gas/gas Rekuperator Gastrocknung 268 kW Erdgas Erdgas -21 32 35 -12

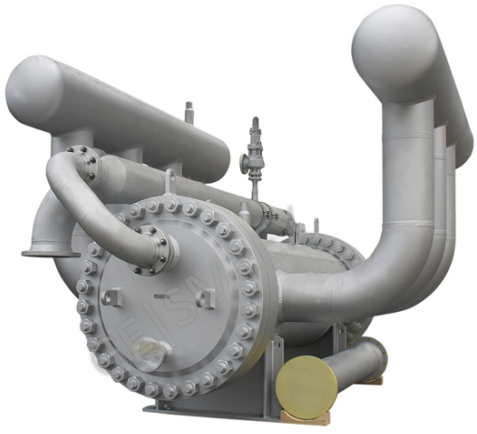
*Chiller*
*Type: XPS 100*
*Design: countercurrent flow, fully welded*
*Special features: evaporating refrigerant cools natural gas*
*Installation site: Germany*

AU00227-XPS50-0750-RMT/GDF-P340 0750 kW Erdgas GDF Module Standard GTA R1270 -10 -15 -17 liq/evap Verdampfer Chiller 23

## Natural gas pre-heater (Dew Point Heating)

If natural gas is expanded in a turbine, it is cooled by a phenomenon known as the Joule-Thomson effect. This changes the dew point, and causes heavier hydrocarbons to condense out, which can damage downstream equipment. It also changes the calorific value of the gas, and is necessary to heat the gas.

Heat exchangers are used to heat the gas with large distributors, due to the two phase flow:

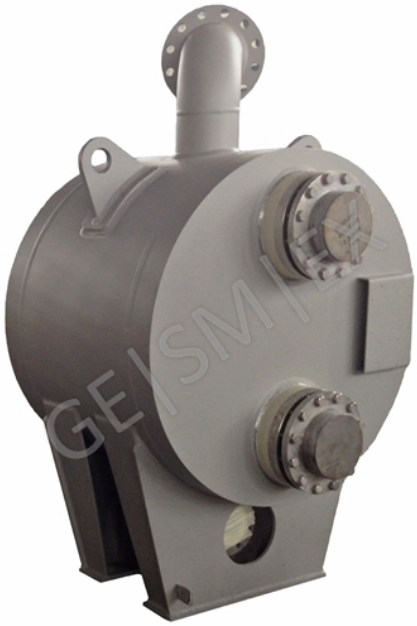


Natural Gas Preheater
Type: XPS 200
Design: openable
Features: high-pressure, gas distribution necessary
*Installation site: Germany*

AU00029-XPS150-0472-GASSCO-P340

## Liquified Natural Gas (LNG)

Liquefied natural gas (LNG) is increasingly playing a larger role in the global energy mix, especially in areas, where there are little or no natural gas reserves, or no pipeline network. The LNG is usually transported on ships. Large, cryogenic, heat exchangers capable of pressures up to 80 bar, are required in the liquefaction and regasification plants in inport and export terminals. For liquefying the gas must be repeatedly compressed and cooled. An effective heat transfer as in Plate and Shell heat exchangers is a great cost saving, where close temperature approaches enable a reduction in the energy required in the refrigeration plant also.



Re-condenser
Type: XPS 200
Design: Fully welded
Special features: low temperature application Marine
*Installation site: Germany*

AU00211-XPS200-0817-TGE-P350

- Kondensator: flüssig / dampfförmig
- Plate & Shell Typee: XPS 200 H/11
- design: -50 – 150°C / -1 – 25 bar
- Platten: 3.7025/Ti.

## Natural gas sweetening

The removal of $H_2S$ and $CO_2$ from sour gas is called gas sweetening. The sulfur content allowed in pipeline specification natural gas is subject to a limit. If too much hydrogen sulfide is in the natural gas, it has to be removed before being fed to the pipeline. The sulfur is often absorbed with a regenerable solvent, typically amines such as MEDA, or DEA are used. Before the absorption process, the solvent must be heated, via an interchanger, and regenerated in a scrubbing tower, with a reboiler, before being cooled and put back into the absorption column. For these process steps the Plate and Shell is an ideal heat exchanger.

Gas cooler in the natural natural gas sweetening
Type: XPS 50
Design: Fully welded
Features: acid-resistant materials
Install: Germany

200080- XPS50-0140- BASF- Dampf / Kondensat vs. VE-Wasser

xxx

## Hydrogen production

In industrial production of hydrogen, light hydrocarbons from natural gas are processed to pure hydrogen. The most common method is using a steam reforming, where steam is added to a hydrocarbon mixture and is heated to react to produce hydrogen and carbon monoxid.
XPS - Plate & Shell heat exchangers are used in the steam system for condensate cooling and boiler feed water heater. Due to high temperatures, the system require high design pressures. Here the high pressure resistance of laser-welded GESMEX - apparatuses is particularly advantageous.

← Example: boiler feed water cooler
Type: Plate & Shell, XPS 50, design pressure 135 bar, openable, multi-pass at plate side,
Installation site: Finland

AU00301-XPS50-0947-Linde-Poorvo

Wasserstoffanlagen zur Erzeugung von Wasserstoff Linde AG XPS 50-90H51 2,50_1.4404; P355NL2/NH; 0947; Hydrogen production unit, Poorvo liq/liq

BFW cooler 60 kW Boiler feed water Cooling water

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and supply systems*

.. ...

*... more about heat recovery*

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

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- **Kältetechnik**
  - **Ammoniakkälte**
  - **CO2-Kälte**
  - **Eisspeicher (ACO)**
  - **Kryogenanwendungen ??**



## Plate heat exchanger in industrial refrigeration

In refrigeration Plate and shell heat exchangers are used as evaporators or condensers.

▪ Evaporator:

The evaporating refrigerant cools the hot fluid (for example, an external glycol circuit) by taking the heat out as latent heat, therefore having a low flowrate and a high heat transfer cofficient. The evaporator in the refrigeration cycle is also called "Chiller".

▪ Condenser:

Plate and Shell heat exchangers are mainly used as a condenser when a liquid needs to be heated on the secondary side, for heat recovery. When there is no heat recovery required, or suitable heat sink, the heat is ejected directly to the ambient air, finned tube heat exchangers are typically used as “air condensers”.

---

## Ammonia refrigeration

Ammonia is often used as refrigerant for cooling temperatures in the range -10 °C to -20 °C. GESMEX heat exchangers are very well suited for evaporators. A large nozzle on the shell accomodates the low density vapour. Separators can be integrated in the shell remove liquid droplets.

200090-XPS50-0165-Airtech-E320

*Oil cooler, flooded ammonia evaporator*
*Type: XPS 50*
*Design: Fully welded*
*Special features: with dome to increase the vapor space*
*Installation site: Italy*

AU00204-XPS150-0810-Wacker-E320

*Oil cooler, flooded ammonia evaporator*
*Type: XPS 150*
*Design: Fully welded*
*Special features: eccentric plate pack with internal droplet separator*
*Installation site: Germany*


AU00342-XPS100-1013-Marefsup

*flooded ammonia evaporator with separator*
*Type: XPS 100*
*Design: Fully welded*
*Special features: eccentrically with external droplet separator*
*Installation site: Netherlands*

---

## $CO_2$ - refrigeration

Carbon dioxide ($CO_2$) is a natural refrigerant, which is increasingly being used. $CO_2$, compared to synthetic refrigerants (R134a, for example, R12) has a lower environmental impact, with a lower global warming potential, and no harmful effects on the ozone layer. However, high evaporation pressures of 30-40bar are needed to operate a refrigeration cycle.
This is above the capability of conventional plate and frame heat excaner, however GESMEX heat exchangers are particularly well suited for $CO_2$ evaporators, since they have an extremely high pressure capability, whilst providing the advantages of a plate heat exchanger.

| | Bei -10°C | Bei +35°C |
|---|---|---|
| R507 | 4,5 bar | 16,6 bar |
| $NH_3$ | 2,9 bar | 13,5 bar |
| $CO_2$ | 26,5 bar | ca. 90 bar |

xxxx

*Flooded $CO_2$ evaporator with separator*
*Type: XPS 50*
*Design: Fully welded*
*Special features: design pressure 120 bar*
*Installation site: mobile in a container*

---

## Heat exchangers in utility systems and for heat recovery

In addition to process-specific tasks, GESMEX plate heat exchangers ...

*... more about auxiliary and supply systems*

.. ...

... more about heat recovery

## Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

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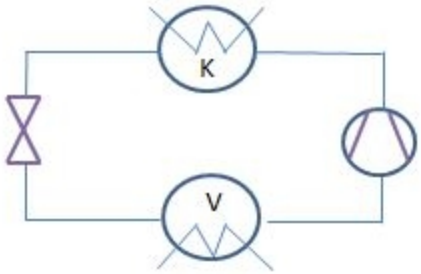
# Plate heat exchanger in plants for heat recovery & ORC – plants

In almost all systems, every attempt is made to ensure against energy losses and the system efficiency can be optimized. A major contributor to this is the recovery of heat from waste water, waste steam, exhaust gases or waste heat from production processes. If the energy is of a high enough quality, the waste heat can be used to generate electricity in Organic Rankine Systems (ORC) systems. GESMEX plate heat exchangers work in heat recovery systems as recuperators, heaters, evaporators and condensers in ORC systems.

The following examples show the experience of GESMEX in these areas:

## Power generation in ORC-systems




The evaporator transfers heat from the waste heat source to the working medium in the ORC cycle. Waste heat sources, for example, are hot exhaust gases, with temperatures of up to 300°C, can be led directly through the Plate & Shell heat exchanger. If the temperatures are too high, or when water is condensed due to the cooling of the exhaust gas, acids can occur can cause severe corrosion. In such cases an indirect heat transfer is preferred.
If a liquid medium is used for cooling, the XPS Plate and Shell is very well suited to this. For air cooling usually air condensers which are built from ribbed plates or tubes.

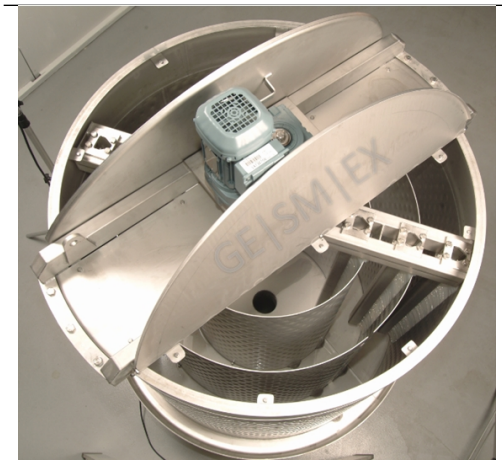
AU00002-XPS100-0404-UniBayreuth-E490
Abgas gegen Cyclopentan

*← Example: Direct expansion of an organic fluid in a ORC plant for decentralized power generation*
*Type: Plate & Shell, XPS 100, the compact design enables minimization of the filling volume in the ORC - circuit and a fast response time*
*Installation site: Finland*

## Heat recovery from waste water

Wastewater heat exchangers transfer heat from hot wastewater to heat cold freshwater. This reduces the energy required to preheat the incoming water. For the function of biological sewage treatment plants, the wastewater temperature can be limited and regulatory compliance can be ensured to the maximum initiation temperatures.
XPT - Thermo Plate heat exchangers can be manufactured with ring-shaped heat transfer surfaces. A rotating brush system keeps the transfer surfaces free of biological deposits. The units are accessible from above and sedimentary deposits can be removed through openings in the bottom.

*← Example: waste water heat exchangers, cooling medium flow water*



*Type: XPT - Therm-X, accessible with circulating brush system,*
*accessible from above and via manholes for manual cleaning of rough sedimentations*
*Installation site: Germany*

AU00095-XPT-A003-DAS-P165

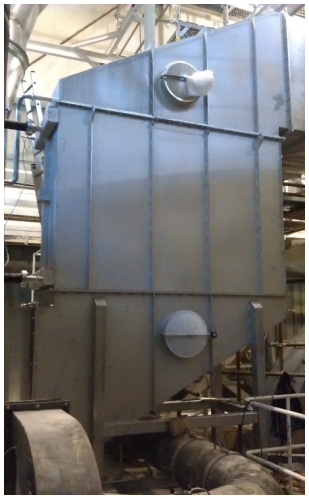
## Heat recovery from flash steam

Flash steam condensers condense exhaust vapour arising in steam systems, when condensate is led to atmospheric condensate return tanks, steam is flashed off from the hot condensate. The latent heat from the exhaust vapors are condensed and the heat recovered for other users, e.g. preheating of fresh water for feedwater dearators. XPS - Plate & Shell heat exchangers are effective condensers even at low steam pressures (under vacuum). Corresponding to the low vapor density and the resulting high flow velocities of steam the steam inlet nozzle sizes can be big and the condensate outlet nozzles can be made small.

*← Example: flash steam condensator for pre-heating of feedwater*
*Type: Plate & Shell, XPS 50, fully welded, two passes at plate side*
*Installation site: Germany*

200043- XPS50-76 H/21-0089-LANXESS

## Heat recovery from exhaust gases



Exhaust or exhaust air heat exchangers withdraw energy from the exhaust stream, which can be used for preheating or heating in other processes.
XPT - Thermo Plate heat exchangers transfer the heat from the exhaust stream to running up air (Type: XPT - gas / gas) or to a liquid circuit (Type: XPT - Process Therm). The heat exchangers can be integrated directly into the exhaust stream, can be adapted to the dimensions, also the number and arrangement of heat transfer surfaces can readily fit into existing plants.

*← Example: exhaust air heat exchanger, coolant: water*
*Type: XPT - Process Therm, cleaning during operational production is possible*
*Installation site: Germany*

Ordner: 1110 Bilder Heat Recovery von ACO

## Heat recovery from process heat

In production plants, individual production stages often require the cooling of products. The heat extracted from products can be fed to other consumers for an optimal energy utilization of the production plant.
XPS - Plate & Shell heat exchanger can transfer the heat from the liquid or gaseous products to other products or into auxiliary systems. If the energy is of a high enough quality, valuble low-pressure steam can be generated with the waste heat. When several production trains are in parallel, the coolers can be grouped into modules.

*← Example: product coolers and low-pressure steam generation*
*8 x Plate & Shell, XPS 50, integrated in a module with a vessel for vapor collection*
*Installation site: Germany*

AU00114-Modul-0676-API/Rütgers-P420 *RÜTGERS Basic Aromatics GmbH DEU AU00114 API Schmidt-Bretten GmbH & Co. KG XPS 50 130 H51 0,60 1.4404 P265GH 0-verschweißt*

# Facts about welded plate heat exchangers

XPS - Plate & Shell heat exchangers are…

Informationen anfordern

Anfrage senden

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- **Plate heat exchangers in auxiliary and supply systems**
  - **Steam heater**
  - **Oil cooling**
  - **Immersion bath cooling**
  - **Jacket cooling**
  - **Compressed air drying**
  - **Vapour-Phase-drying**



## Plate heat exchangers in auxiliary and utility systems

In addition to many process-specific duties, GESMEX supplies plate heat exchangers across all industries as reliable heaters and coolers in utility and auxiliary systems. These are applications such as, heating process water, and cooling oil or drying compressed air. Through the direct application of heat transfer, jackets can be cooled and drain trays can be heated. In more specific applications, e.g. as for surface treatment such as electropolishing, it is about the cooling of baths, or about steam drying surfaces.

The following examples show the experience of GESMEX in these areas:

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### Steam heating

Steam heaters in utility and auxiliary systems heat process water, or cleaning solvents, or other media that are required during production. They are mainly used in systems, where steam is already available and can be used, cost effectively, as a heating medium.
XPS - Plate & Shell heat exchangers are effective condensers. Therefore the units are very compact and have short response times. During operation with clean media there is no maintenance over the life time of the heat exchangers.

*← Example: steam heater for heating a cleaning solution*
*Type: Plate & Shell, XPS 50, with stainless steel shell for installation in hygienic plants*
*Installation site: Holland*

200129-XPS50-0251-GESTRA-E420

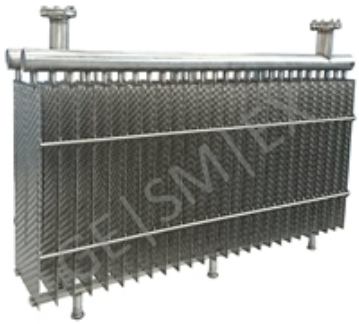
## Oil cooling

200092-XPS50-0168-Crystallisation *

Oil coolers remove the heat from lubrication of bearings, and other frictional heat from the engine to the outside.
XPS - Plate & Shell heat exchangers are used in industrial plants, when less pressure and temperature resistant heat exchangers such as brazed or gasketed plate heat exchangers are considered insufficient due to the lower integrity, for such critical duties.

*← Example: Oil cooler in a gas engine power plant*
*Type: Plate & Shell, XPS 50, with plate- and shell side deflections to increase the thermal length*
*Installation site: Belgium*

## Immersion bath cooling



ACO

At immersion bath cooling the cooling surfaces are directly built in the cooling bath. The bath contents can be heated or cooled as stagnant medium or the bath content is circulated via an external pump.

XPT - Thermo Plate heat exchanger can be built as an open battery and and fit into the dimensions of the container. The heat transfer surfaces are accessible for inspection and cleaning from all sides.

*← Example: water bath cooler in an operation for surface treatment*
*Type: Thermoplate XPT as plate battery, freely selectable plate distances,*
*Installation site: Denmark*

One more picture for the topic – Open batteries - Water basin cooler (submersion)

## Jacket cooling

ACO

By applying a heat transfer area from the outside walls of tanks, storage or stirring vessels are used as a direct cooling surface. This type of cooling is used when for cooling surfaces is not enough space in the container or they should be avoided for other reasons.
XPT - Thermo Plate heat exchangers can be welded directly onto the outer surface, or they are built on as separate elements and clamped. In both cases, the transfer surfaces are adapted to the jacket contour individually.

*← Example: Tank with externally applied cooling surfaces*
*Type: Thermoplate XPT, consisting of a thicker plate inside and a thinner plate outside*
*Installation site: Netherlands*

## Compressed air drying

200180-XPS50-0354-INEOS-E440

Compressed air dryers cool down compressed air in order to condense the water vapor brought in from ambient, and drain it from the compressed air system. The units can be operated with cooling media such as water or, with a compressed air refrigeration dryer, with refrigerants.
XPS - Plate & Shell heat exchangers are effective coolers and condensers. The cylindrical shell allows, besides the condensation of water vapor, the separation of air from the condensate in one heat exchanger, by leading the media out via separate nozzles.

*← Example: compressed air dryer, coolant: water*
*Type: Plate & Shell, XPS 50, openable, with condensate collector and separate outlet for dry air and condensate*
*Installation site: Germany*

## Vapour-Phase-drying

Vapour-phase drying is a process in which steam is in direct contact to the components to be dried. While contaminants such as oil are washed out, also a cleaning ef-

200062-XPS100-0112-Meier-E450

fect occurs. To increase the cleaning action, solvents such as kerosene are used in the steam cycle. In order to avoid damage to sensitive components, the process takes place at lower temperatures and under vacuum.
XPS - Plate & Shell heat exchangers are very effective evaporators, and well suited for the use under vacuum due to their short length. The design allows the installation on a slope, additional drain nozzles for non-volatile component contaminants, and an ec-centric shell is utilized to increase the steam room.

*← Example: Kerosene evaporator under vacuum, heating medium steam*
*Type: Plate & Shell, XPS 100, fully welded, eccentrical shell, orientation with a slope to drain oil residues*
*Installation site: Russia*

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